

U.S. Software Lifecycle Process Standards

The Electronic Industries Association (EIA) and the Institute of Electrical and Electronic Engineers (IEEE), both accredited standards-developing organizations, have been collaborating with the Department of Defense (DoD) on the development of software lifecycle standards for use in the United States. Three primary objectives have motivated this work:

- The standards should represent the best commercial practice.
- The standards should be suitable for application to the complex requirements of defense acquisition.
- The standards should be compatible with those of the emerging global marketplace for software.

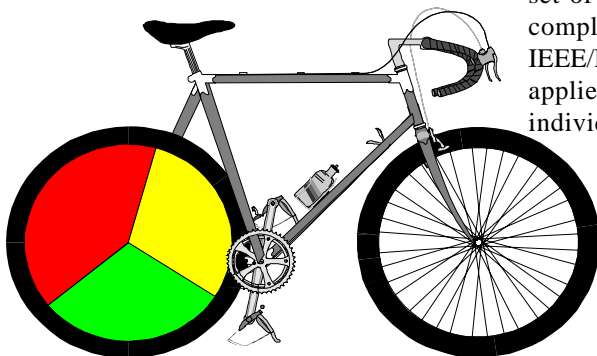
As a result of this work, two standards will shortly be approved:

- IEEE/EIA 12207 is the *strategic* standard that addresses the

objectives in the previous paragraph. It is an adaptation of the international standard, ISO/IEC 12207, and provides a basis for organization-wide adoption of software processes suitable for commercial and defense projects that serve both domestic and international customers.

- EIA/IEEE J-STD-016 is the *tactical* standard that provides a continuing reference for organizations that have invested in software processes created under prior military standards. An important difference from the military standards, though, is that this standard is properly applied through voluntary adoption rather than contractual imposition.

The U.S. adaptation of the standard **IEEE/EIA 12207** has shifted its focus toward compliance at the organizational level rather than at the level of the individual project. The preferred usage is that an enterprise would develop its own set of processes and procedures compliant with the requirements of IEEE/EIA 12207, which would be applied across the enterprise. Any individual project conducted by the enterprise would select the appropriate enterprise processes and procedures and parameterize them for application to the individual



continued on page 3

How “Open” Is Your System? *Part 2*

by P. A. Dargan

Competing Standards

While the goal of open systems is a set of complementary, interoperable, and portable standards for heterogeneous computers, standards exist that define competing services for the same categories. Figure 2 provides an example. One explanation for the competing standards is that not all standards organizations are combining efforts, resulting in different standards for similar services.

Selecting Open System Standards

Organizations are providing a standards profile with their enterprise architectures to aid in procurement. “Ah,” you think, “help at last!” only to discover that instead of finding your way out of the morass, the profile lists

continued on page 2

ALSO INSIDE THIS ISSUE...

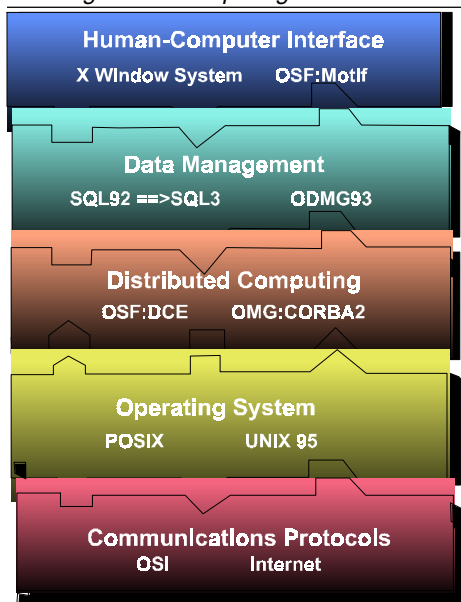
Helpful Hints: Use of Circular Number A-119.....4

Editor's Flashpoints.....4

continued from page 1

all existing standards (and there are many more than shown in Figure 2).

Figure 2. Competing Standards



To select a suitable set of standards, redefine the profile as a list of *single* (rather than competing), complementary, compatible open system standards for the infrastructure.

Identify complementary, compatible standards by looking for *interdependence*: standards that were *defined* to interact together with complementary services and well-defined interfaces. Recalling how computer circuit boards are designed to fit into PCI slots, interdependent infrastructure standards are designed for easy integration. Selection criteria include:

STANDARDS SELECTION CRITERIA

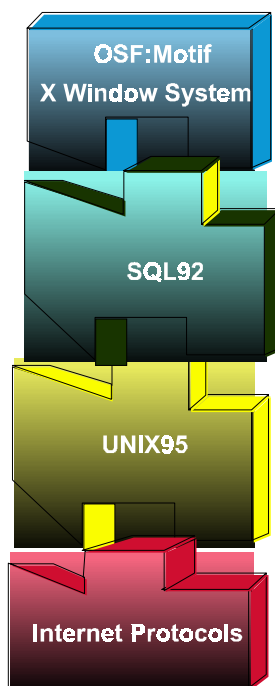
- * Interdependent standards for interoperability.
- * Mature and stable standards.
- * Scalability and portability are important—select standards that have a future.
- * Marketplace support and product availability are key. Choose

standards that major vendors support on multi-vendor platforms with proven/branded products.

- * Standards that can support other technologies, such as collaborative computing.

Figure 3. shows a sample UNIX 95 profile composed of interdependent standards. While other combinations are possible, this profile is shown because it has been successfully used on a number of large programs. Include the standards profile in the solicitation, and require that development contractors procure *conformant products*.

Figure 3. UNIX 95



Procurement: Implementing the Profile

Standards conformance is an important consideration for procurement. When vendors claim that their product *complies* with standards rather than *conforms*, beware: system incompatibilities could occur if used with conformant products, leading to disastrous results.

Conformance measures the *degree of adherence to standards*, and branded products provide full-

conformance. In addition, branded products provide the desired “plug and play” on multi-vendor platforms.

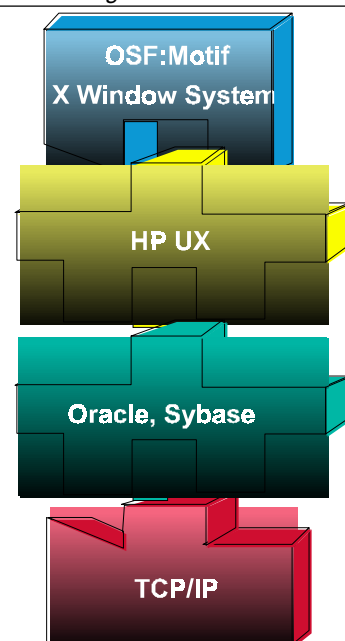
When products are compliant, vendors may provide bridge products to interface with conformant products, but use them at your own risk: bridge products may not resolve all incompatibilities.

Figures 4 and 5 show two possible implementations of the UNIX 95 profile. U.S. DoD’s Defense Information Infrastructure (DII) Common Operating Environment (COE) (Figure 4) conforms to the UNIX 95 profile, provides interoperable, compatible components, and has been fielded.

The Windows NT example (Figure 5) does not conform to UNIX 95, resulting in the need for bridge products like Nutcracker and Object Data Base Connectivity (ODBC) to interface with the other conformant products, but there are still some incompatibilities.

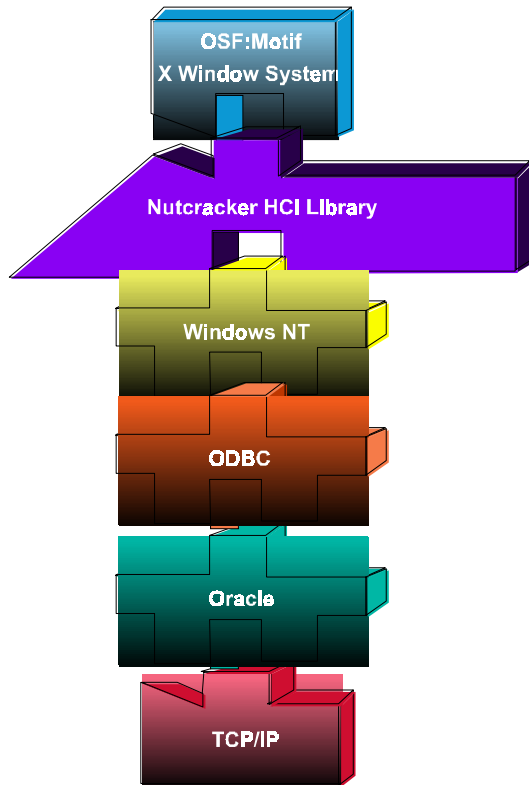
There are rumors that Microsoft may produce a future version of Windows NT that conforms to UNIX 95, but time will tell. Until then, which implementation example would you recommend?

Figure 4. DII COE



STANDARDS PLUS

Figure 5. Windows NT Example



System Openness

So how open is your system? The answer is relative, depending on how many standards you use; how interdependent the standards are (the greater the number of bridge products needed, the less open the system); whether commercial products are used to implement the standards (stay away from custom products); and whether the commercial products are fully-conformant (best) rather than partially-compliant.



STANDARDS Plus!

Published by
Systems Engineering
Standards Group, ASD-120.

For article ideas and comments,
please call:

John Snow, ASD
202/358-5186

Tammy Wates, ASD/SETA
202/651-2228

continued from page 1

project. IEEE/EIA 12207 offers some important advantages over existing software lifecycle process standards.

- Its coverage of the entire lifecycle contrasts with the typical treatment of only development processes.
- It provides a flexible approach to recording process and product data to be handled by computer-aided software engineering tools in contrast to more traditional reliance on paper documents.
- It incorporates specific references to other U.S. standards that may be helpful in the detailed implementation of lifecycle processes.
- It provides a set of process and data objectives that guide adaptation of the requirements of the standard in unusual situations.
- It is compatible with the ISO 9000 approach to quality systems, quality management, and quality assurance.
- It is fully compliant with the international version of the standard, permitting U.S. companies to develop a single set of enterprise processes applicable to both global and domestic business.

EIA/IEEE J-STD-016 is the "demilitarized" version of MIL-STD-498. It is anticipated that most organizations will have a long-range goal of compliance with IEEE/EIA 12207. In the short term, though, many organizations continue to execute processes that are a legacy of older standards and need a document that permits them to reference those processes. J-STD-016 is intended to fill that role. It is suitable for application in the following circumstances:

- For use in continuing projects that began under MIL-STD-498 or one of its predecessor military standards.
- By enterprises that have implemented organizational processes

based on MIL-STD-498 or one of its predecessors.

- By projects that desire to continue using the documentation structure specified in J-STD-016.

J-STD-016 will remain in place as long as a need exists. In accordance with normal EIA and IEEE procedures, it will be periodically reviewed.

MIL-STD-498 is an example of the cooperative efforts between government and industry, and is the most recent in the DoD series of software development standards. It serves as a basis for the standards discussed in this article. With the recent DoD shift toward the use of commercial standards, the contractual imposition of military standards is no longer appropriate. Both government and industry agree that the commercial standards rather than military standards should be used and that they should be voluntarily adopted rather than contractually imposed. DoD plans to withdraw MIL-STD-498 as the IEEE/EIA 12207 and J-STD-016 standards are approved by ANSI. The Council of Defense and Space Industries Association has taken the position that the life of MIL-STD-498 should not be extended. Current users of MIL-STD-498 should consider shifting to J-STD-016—they will find its processes to be similar to those of MIL-STD-498.

It should be emphasized that all of the commercial standards mentioned in this article are designed for voluntary adoption rather than contractual imposition. Organizations will want to apply these standards because their use improves the quality of their products and the competitiveness of their offerings. Furthermore, reference to these standards dramatically simplifies the explanation of organizational processes to prospective acquirers.

This article is a reference from CROSSTALK, July 97.





HELPFUL HINTS

Use of Circular No. A-119

Back in October 1993, Leon Penetta, Director OMB, issued Revised Circular No. A-119. The purpose of the circular was to establish policy in working with voluntary standards bodies and in adopting and using voluntary standards. It is recognized that participation in the standards-related activities of these voluntary bodies and adoption of voluntary standards eliminates the cost to the FAA (And Government in general) of developing its own standards. The circular requires the heads of agencies concerned with standards to do three tasks:

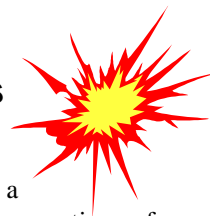
- 1 Implement the policy outlined in the circular
- 2 Designate a senior level official as the Standards Executive for agency-wide implementation

- 3 Review their existing standards and replace those for which an adequate and appropriate voluntary standard can be substituted.

The agency is required to submit a yearly summary report outlining the number of agency employees participating in standards groups, the number of voluntary standards the agency has adopted and the number of standards the agency has replaced with voluntary standards. Developers and users of standards should become familiar with OMB Revised Circular No. A-119. It is available via the internet at: www1.whitehouse.gov/WH/EOP/OMB/html/circulars/a119/a119.html#1



Editor's Flashpoints



Today, the NAS is a mixture of several generations of automation equipment. Some of these systems were purchased when proprietary solutions were necessary to meet system requirements, and many interfaces are not based upon standard protocols. This drives up maintenance costs and increases the need for the development of new system interfaces to ensure interoperability with existing equipment. As these systems are replaced, there is an active effort to adopt profiles of open system standards which cut across different organizations within the FAA. The benefits of these open system standards are increased interoperability and reduced life cycle costs by establishing a basis for a common development environment across projects.

The major effort entails steering new system development activities toward a targeted set of open system standards that are currently available commercially. As an example, one has to be careful when trying to enforce one or two particular standards upon a project or organization. Mandatory compliance to one "set" of standards, ignores the ever-changing commercial market and the need to rationally balance the imposition of standards against the availability of COTS solutions. However, in order to satisfy the faction supporting the 'enforcement' argument, it can be agreed upon that the development and mandate of a standards technical architecture is essential to ensure that approved/accepted sets of standard profiles are in place to provide a basis for selection by the various projects/organizations within the FAA.

